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(54) PROCESS FOR THE MANUFACTURE OF FIBROUS PRODUCTS WITH COATED, HEAT-SEALABLE AND PRINTABLE SURFACE, AND SIMILAR FIBROUS PRODUCTS

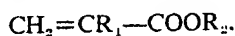
- (71) We, LONZA LIMITED, of Gampel/
 Valais, Switzerland, a Joint-Stock Company
 incorporated under Swiss law, do hereby
 declare the invention, for which we pray
 that a patent may be granted to us, and
 the method by which it is to be performed,
 to be particularly described in and by the
 following statement:—
 The present invention is concerned with
 a process for the manufacture of fibrous
 products with a coated, heat-sealable and
 printable surface.
 The treatment of the surface with a coat-
 ing stock for the finishing of high-grade
 paper, for example art and chromo papers,
 is known. In this way, interstices are filled
 up and a smooth surface is produced which
 makes clearly defined reproduction possible
 on printing. A suspension of pigments and
 a binder, in the proportion of roughly 4
 to 6, is used for the coating stock. The
 binder consists principally of casein and
 starch products, which latterly have also
 been entirely or partly replaced by synthetic
 binders. For hot-sealing the surface, if
 necessary after printing, a plastics coating
 is subsequently applied.
 The object of the present invention is to
 provide a process which, in one operation,
 provides a fibrous product with a surface
 which is heat-sealable and printable.
 Thus, according to the present invention,
 there is provided a process for the manufac-
 ture of fibrous products with a coated, heat-
 sealable and printable surface, wherein the
 heat-sealable and printable surface is pro-
 duced by applying in one pass to a fibre
 material a coating stock which contains
 pigment and binder in a weight ratio of 0.8
 to 4.0, preferably of 1.8 to 3.4, the binder
 being an aqueous dispersion containing at
 least one natural binder as hereinafter de-
 fined known for the preparation of coating
 stocks and at least one thermoplastic syn-
 thetic resin with particle size of 0.2 to 3 μ
 in an amount of more than 50% by weight,
 preferably of 50 to 95% by weight and
 more preferably 65 to 80% by weight, refer-
 red to the total dry binder, and prefer-
 ably of more than 20% by weight, referred
 to the dry coating, the thermoplastic syn-
 thetic resin having an ultimate break elon-
 gation of at least about 300% and prefer-
 ably of 400 to 900% and a heat-sealing tem-
 perature of 70 to 160°C.
 It is to be understood that when two or
 more thermoplastic synthetic resins are
 used, then the mixture of such resins must
 satisfy the above stipulated requirements
 regarding particle size, ultimate break elon-
 gation and heat-sealing temperature.
 A pigment-to-binder ratio of about 1 to
 2.5 is particularly preferred, i.e. 40 to 100
 parts by weight of binder to 100 parts by
 weight of pigment. A pigment-to-binder
 ratio of around 2 is especially favourable.
 The natural binders which are to be
 used according to the present invention are
 naturally-occurring materials or derivatives
 thereof which are known as binders for
 coating stocks and include, for example,
 casein and starch or starch products.
 The heat-sealing temperature of the
 thermoplastic synthetic resin used is, as
 stated above, between 70 to 160°C. It is
 important that the range between softening
 and rehardening should be as small as
 possible and that rehardening commences
 at as high a temperature as possible, in
 order to prevent excessive stickiness.
 The thermoplastic synthetic resins to be
 used according to the present invention can

[Price 25p]

be obtained by copolymerisation and terpolymerisation in dispersion of, for example, the following monomers: vinyl chloride, vinyl esters, vinyl ethers, acrylic acid and acrylic acid esters, methacrylic acid and methacrylic acid esters, maleic acid and maleic acid esters, fumaric acid and fumaric acid esters, isobutylene and ethylene. Preferably, there is used a dispersion polymerisation product of 20 to 40% by weight of vinyl chloride, 20 to 50% by weight of a vinyl ester containing up to 3 carbon atoms in the acid radical and 25 to 50% by weight of a compound of the general formula



wherein R_1 stands for a hydrogen atom or a $-COOR_3$ radical, R_2 stands for a hydrogen atom or a methyl radical and R_3 stands for an alkyl radical containing 4 to 8 carbon atoms. Instead of or in addition to this dispersion polymerisation product, there can advantageously also be used a dispersion polymerisation product of 10 to 85% by weight of a compound of the general formula



wherein R_1 stands for a hydrogen atom or a methyl radical and R_2 stands for an alkyl radical containing up to 8 carbon atoms, 85 to 10% by weight of a vinyl ester and 2 to 10% by weight of acrylic acid. According to a further preferred embodiment of the present invention, the thermoplastic synthetic resin used is a dispersion polymerisation product of 5 to 40% by weight of vinyl chloride, 40 to 80% by weight of a vinyl ester containing up to 18 carbon atoms in the acid radical and 5 to 25% by weight of ethylene. These aqueous dispersion polymerisation products are made in known manner with the use of protective colloids and emulsifiers.

The natural binding agents also used according to the present invention, such as casein, starch and starch products, are rendered water-soluble in known manner.

Known fillers, for example, kaolin, talc, asbestine, gypsum, blanc fixe (barium sulphate), magnesite, chalk, titanium dioxide, calcium silicate and kieselguhr, can be used as pigments for the coating stock. The coating stock can also be stained or dyed.

Materials containing cellulose, such as paper, pasteboard and cardboard are principally used as fibrous products. They can be produced from a large variety of raw materials, for example, wood straw or rags or the like.

The amount of coating stock to be applied depends largely on the porosity and degree of sizing of the fibrous products.

Good results are obtained by applying 15 to 25 g. coating stock per square metre, referred to the dry weight.

According to the process of the present invention, paper, pasteboard and cardboard can be produced with a printable and heat-sealable surface in one operation. These products can also be heat-sealed one to the other.

A further possibility consists in bonding on other materials, for example synthetic resin films, to the heat-sealable surfaces. Thus, so-called blister packagings can be made by simple bonding. For bonding, there can be used the known methods, such as heat-sealing, high frequency and thermosurge processes.

It is often advantageous to add a so-called adhesion improver to the coating stock. Such substances include rosins, for example, colophony glycerol esters and hydrogenated rosin compounds, coumarone resins, coumarone-indene resins, polyterpene resins and alkyd resins.

The addition of adhesion improvers is especially advantageous when synthetic resin materials, such as films, are to be applied to the heat-sealable surface. Depending upon the nature of the synthetic resin to be bonded, for example a film, the adhesion and workability can be improved by the use of such adhesion improvers. If, for example, hard polyvinyl chloride sheet is used, then coumarone resins are particularly useful as adhesion improvers. The quantity to be used is preferably between 1 and 5% by weight, referred to the amount of thermoplastic synthetic resin in the aqueous dispersion.

When printing a fibrous product obtained by the process according to the present invention, it is advantageous to use a printing ink containing 15 to 30% by weight of a thermoplastic synthetic resin dispersion, calculated on a 50% by weight dispersion, the thermoplastic synthetic resin satisfying the above-stated requirements of the thermoplastic synthetic resin used for coating the fibrous material. In this way, the printed areas and surfaces obtained are also heat-sealable.

The following Examples are given for the purpose of illustrating the present invention:—

EXAMPLE 1.

A woodpulp cardboard with a weight per unit area of 400 g/m², the surface of which had been treated with a starch solution containing pigment at a rate of about 5 g/m², was coated on one side with a 35% by weight coating stock, the solids content of which consisted of 60% by weight of china clay pigment, 35% by weight of a thermoplastic synthetic resin binder and

5% by weight of casein, the remaining 65% by weight of the coating stock being water, at an absolutely dry rate of 18 g/m². The thermoplastic synthetic resin binder used consisted of a mixture of equal parts of (a) an aqueous dispersion polymer of 35% by weight vinyl acetate, 35% by weight butyl acrylate and 30% by weight vinyl chloride, the polymer having a particle size of 0.2 to 3 μ , and (b) an aqueous dispersion polymer of 49% by weight vinyl acetate, 49% by weight butyl acrylate and 2% by weight acrylic acid, the polymer again having a particle size of 0.2 to 3 μ . The mixture of the two polymers had an ultimate break elongation of more than 300%. In this mixture of (a) and (b) was emulsified 3% by weight of a coumarone resin with a softening point of from 20 to 30°C., as an adhesion improver. The above percentages relate to solid (dry) weight. The coated surface of cardboard was smoothed or glazed.

Part of the cardboard so prepared was cut out and various blisters of polyvinyl chloride sheet or film bonded thereto. Bonding was effected at one pass by means of an automatic heat sealer, in which the upper tool was heated to 180 \pm 5°C. The sealing of the negatively (concave) deep-drawn or dished blisters (thickness 0.2 mm.) was carried out on the cardboard side. The sealing area was 20 cm², the contact pressure was 100 kg., the sealing time was 3 to 3.5 seconds and the effective seam temperature was 110°C. A further bonding of a positively (convex) drawn blister (thickness 0.2 mm) was carried out by a high frequency bonding process (1.5 kW). The sealing area was 9 cm², the contact pressure was 120 kg. and the duration of sealing was 1.5 seconds. A further piece of cardboard was printed over the whole surface with a printing ink containing 25% by weight (dry content) of the above-described mixture of resins (a) and (b) and immediately thereafter, a positively (convex) drawn blister (0.3 mm.) was bonded in quadruple by high frequency bonding (2 kW). The top electrode was pre-heated to 80°C. before bonding. The bonding area was 80 cm², the contact pressure was 150 kg. and sealing time was 1.8 seconds.

Another piece of the cardboard, coated on one side, was treated in the following manner: two widths of the board were pasted together on their uncoated surfaces to form a two-ply board having 800 g/m² bondable material on each side. The board was then trimmed and high-frequency bonded in a one pass coat against coat on one side and coat against polyvinyl chloride blister on the other side, the upper tool used having been pre-heated to 170°C. when it was applied to the board. The contact pressure

was 150 kg., the sealing area was 80 cm² and the sealing time was 4 seconds.

EXAMPLE 2.

The surface of a fine stock (free of wood pulp) cardboard with a weight per unit area of 250 g/m² was treated with a solution of starch and alginate at a rate of 2 g/m² on a glue press. This cardboard was subsequently coated on one side with a 45% by weight stock, the solids content of which consisted of 65% by weight of china clay pigment, 30% by weight of a thermoplastic synthetic resin binder and 5% by weight of starch, the remaining 55% by weight of the stock being water, at an absolutely dry rate of 23 g/m². The thermoplastic synthetic resin binder used was a 30:70 mix of (a) an aqueous dispersion polymer of 80% by weight vinyl acetate, 10% by weight vinyl chloride and 10% by weight ethylene and (b) an aqueous dispersion polymer of 49% by weight vinyl acetate, 49% by weight butyl acrylate and 2% by weight acrylic acid. Both polymers had a particle size of 0.2 to 3 μ and the mixture of polymers had an ultimate break elongation of more than 300%. 1.3% by weight of a rosin (Hercules Powder Company "CELLOLYN 21") was added to this thermoplastic synthetic resin dispersion as an adhesion improver ("CELLOLYN" is a Registered Trade Mark).

The coated cardboard was surface-glossed by calendering, trimmed and heterochrome printed with a variety of screens using inks containing 17% by weight, referred to the solids content of the ink, of the above-described binder. On one part of the cardboard, blisters of polyvinyl chloride sheet (0.3 mm.) were bonded by an automatic hot-sealer. The sealing area was 20 cm², the contact pressure 100 kg., the temperature of upper tool 170 \pm 5°C. and the sealing time 2.5 to 3 seconds. The effective temperature in the seam reached 110°C.

Another portion of the cardboard was processed into packing strips by folding board on board coating side and coating side united by hot sealing. Heating took place from the top side. The sealing surface was 10 cm² and the contact pressure 50 kg. The temperature of the upper tool was 160 \pm 5°C. and the effective temperature in the bonding zone was 100°C. The sealing time was 3 seconds. Bonding of board on board could also be effected by high frequency bonding (2kW).

WHAT WE CLAIM IS:—

1. A process for the manufacture of fibrous products with a coated, heat-sealable and printable surface, wherein the heat-sealable and printable surface is produced

- by applying in one pass to a fibre material a coating stock which contains pigment and binder in a weight ratio of 0.8 to 4.0, the binder being an aqueous dispersion containing at least one natural binder (as hereinbefore defined) known for the preparation of coating stocks and at least one thermoplastic synthetic resin with particle size of 0.2 to 3μ in an amount of more than 50% by weight, referred to the total dry binder, the thermoplastic synthetic resin having an ultimate break elongation of at least about 300% and a heat sealing temperature of 70 to 160°C.
2. A process according to claim 1, wherein the weight ratio of pigment to binder is 1.8 to 3.4.
3. A process according to claim 1 or 2, wherein the aqueous thermoplastic resin dispersion contained 50 to 95% by weight of said resin, referred to the total dry binder.
4. A process according to any of the preceding claims, wherein the thermoplastic synthetic resin used is a copolymer or terpolymer of monomers selected from vinyl chloride, vinyl esters, vinyl ether, acrylic acid and acrylic acid esters, methacrylic acid and methacrylic acid esters, maleic acid and maleic acid esters, fumaric acid and fumaric acid esters, isobutylene and ethylene.
5. A process according to any of the preceding claims, wherein the thermoplastic synthetic resin used is a dispersion polymerisation product of 20 to 40% by weight vinyl chloride, 20 to 50% by weight of a vinyl ester containing up to 3 carbon atoms in the acid radical and 25 to 50% by weight of a compound of the general formula
- $$R_1CH=CR_2-COOR_3,$$
- in which R_1 stands for a hydrogen atom or a $-COOR_3$ radical, R_2 stands for a hydrogen atom or a methyl radical and R_3 stands for an alkyl radical containing 4 to 8 carbon atoms.
6. A process according any of claims 1 to 4, wherein the thermoplastic synthetic resin used is a dispersion polymerisation product of 2 to 10% by weight acrylic acid, 85 to 10% by weight of a vinyl ester and 10 to 85% by weight of a compound of the general formula
- $$CH_2=CR_1-COOR_2,$$
- in which R_1 stands for a hydrogen atom or a methyl radical and R_2 stands for an alkyl radical containing up to 8 carbon atoms.
7. A process according to any of claims 1 to 4, wherein the thermoplastic synthetic resin used is a dispersion polymerisation product of 5 to 40% by weight of vinyl chloride, 40 to 80% by weight of a vinyl ester containing up to 18 carbon atoms in the acid radical and 5 to 25% by weight ethylene.
8. A process according to any of the preceding claims, wherein the aqueous dispersion of the thermoplastic synthetic resin contains an adhesion improver.
9. A process according to claim 8, wherein the adhesion improver is used in an amount of 1 to 5% by weight, referred to the amount of thermoplastic synthetic resin in the aqueous dispersion.
10. A process according to any of the preceding claims, wherein the natural binding agent used is casein, starch or a starch product.
11. A process according to any of the preceding claims, wherein the pigment is kaolin, talc, asbestine, gypsum, blanc fixe, magnesite, chalk, titanium dioxide, calcium silicate or kieselguhr.
12. A process according to any of the preceding claims, wherein the coating stock is stained or dyed.
13. A process according to any of the preceding claims, wherein the fibre material used is paper, pasteboard or cardboard.
14. A process according to claim 1 for the manufacture of coated fibrous products, substantially as hereinbefore described and exemplified.
15. Fibrous products, whenever produced by the process according to any of claims 1 to 14.
16. Fibrous products according to claim 15, whenever printed with a printing ink containing 15 to 30% by weight of a thermoplastic synthetic resin dispersion as defined in claim 1, calculated as a 50% by weight dispersion.

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